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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,260	01/14/2002	Hiroaki Kitahara	041514-5211	4661

9629 7590 10/28/2004

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EXAMINER

TURNER, SAMUEL A

ART UNIT	PAPER NUMBER
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2877

DATE MAILED: 10/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/043,260

Applicant(s)

KITAHARA ET AL.

Examiner

Samuel A. Turner

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-4 and 6-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-4, and 6-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings were received on 22 July 2004. These drawings are approved.

Claim Rejections - 35 USC § 103

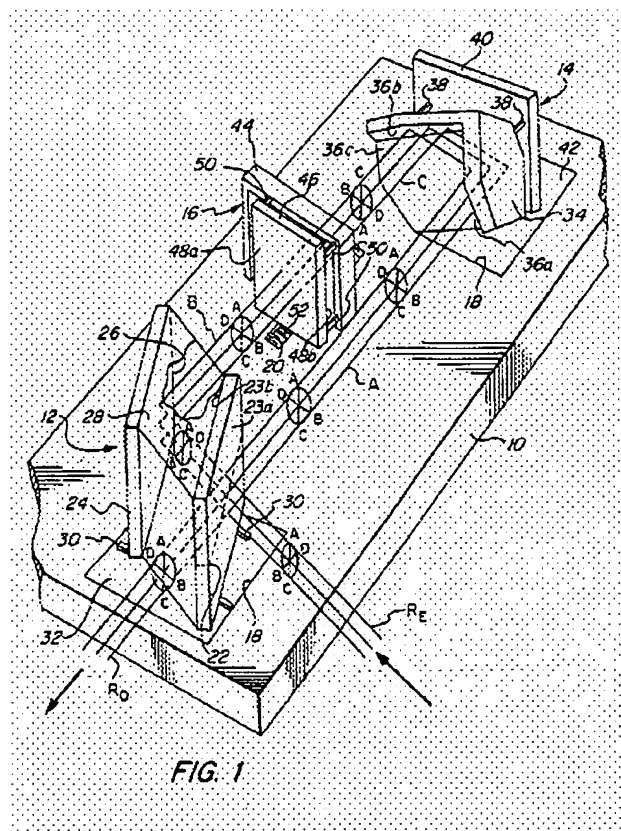
The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

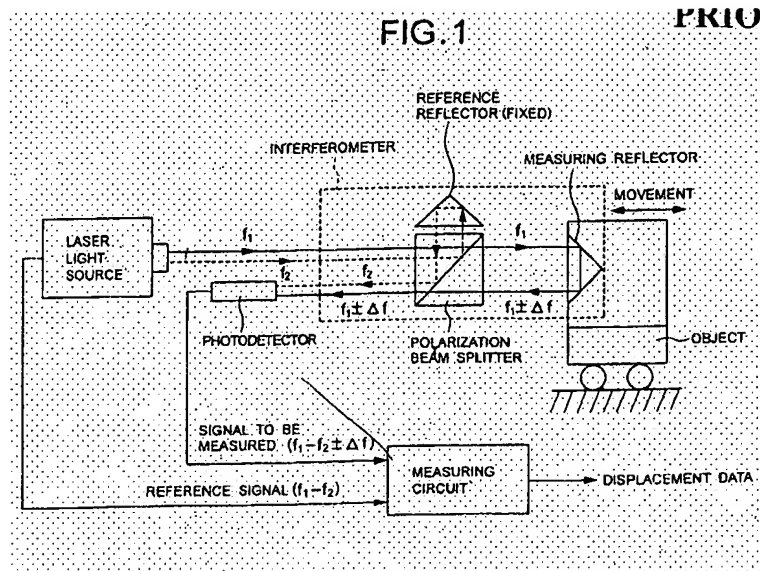
Claims 2-4, and 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solomon(5,675,412) in view of applicant's prior art figure 1.

Solomon teaches a back-to-back mirror interferometer comprising an input beam(R_E), a beam-splitter(22), turning mirror(24), retroreflector(34), back-to-back mirror(16) including reflectors(48a,48b) on opposite sides, and output beam(R_O).

Not taught by Solomon is a specific source, an application to a cylinder, or a heterodyne embodiment.



Applicant's prior art figure 1 teach a typical heterodyne interferometer comprising a laser source which provide two frequencies f_1 and f_2 which are of slightly different frequencies, a displacement interferometer, a detector which detects the beat signal $(f_1 - f_2 \pm \Delta f)$ where $\pm \Delta f$ is indicative of both the displacement and the direction of the moving reflector, and a measuring circuit which receives the signal from the detector. A reference signal $(f_1 - f_2)$ is also supplied to the measurement circuit. The measuring circuit subtracts the reference signal from the beat signal to obtain $\pm \Delta f$, the displacement data.



Official notice is taken that in two arm interferometer, such as Michelson interferometers both homodyne and heterodyne embodiments are known. Homodyne interferometer measure the phase shift between the interferometer arms by counting the fringe displacements and determining direction by the direction of the fringe movement. Heterodyne interferometers detect a beat signal($f_1 - f_2 \pm \Delta f$) which is indicative of both displacement and direction. The difference between homodyne and heterodyne interferometers in measuring displacement is that while homodyne interferometers are accurate to about 1/4 fringe the heterodyne interferometer has not such limitation. See In re Malcom, 1942 C.D 589; 543 O.G. 440.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Solomon interferometer by replacing the light source, and beam-splitter with the two frequency source and a polarizing beam-splitter, and adding $1/4\lambda$ plates in the different arms for polarization beam control

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to provide a heterodyne interferometer. This would not only double the sensitivity of the interferometer because the back-to-back mirror is moving in both paths, a push-pull arrangement, but the heterodyne arrangement is not limited to 1/4 fringe.

With regard to claims 3 and 7 it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify the Solomon apparatus to any object for which displacement along a single axis is to be measured. As the light from the interferometer is incident at only a single location on the cylinder the system optics would not in any way change the function of the apparatus.

With regard to claims 4 and 8, providing a plurality of systems is a mere duplication of parts to measure displacement of the object along another axis, such as found in an X-Y stage. It has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.

Response to Arguments

Applicant's arguments with respect to claims 2-4, and 6-10 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Turner whose phone number is **571-272-2432**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached on **571-272-2800 ext. 77**.

The fax phone number for the organization where this application or proceeding is assigned is **703-872-9306**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see **<http://pair-direct.uspto.gov>**. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at **866-217-9197** (toll-free).



Samuel A. Turner
Primary Examiner
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